

REMARKS

Claims 1-5, 7-40 and 42-51 are pending. By this Amendment, independent claims 1, 24, 36 and 42 are amended to even more clearly distinguish over the applied references. In addition, dependent claims 4, 7, 8, 12, 16, 20, 21, 26, 30-33, 46 and 48-51 are amended for clarity and to be consistent with the amended independent claims. Claims 6 and 41 are canceled without prejudice to or disclaimer of the subject matter recited therein. The specification is amended to correct typographical informalities. The amendments are supported throughout the specification. Thus, no new matter is added by the above amendments.

I. Information Disclosure Statement

The Examiner is requested to consider the information cited in the Information Disclosure Statement filed November 30, 2009.

II. All Pending Claims are Patentable

The objection to claims 1 and 30 has been overcome by the above amendments. Withdrawal of the objections is requested.

Claims 1, 2, 4-14, 19, 22 and 48 stand rejected under 35 U.S.C. §102(e) over Mulkens et al. (US2005/0132914). The rejection is respectfully traversed.

Mulkens et al. does not disclose each and every feature of independent claim 1. In particular, claim 1 has been amended to clarify that the detection apparatus "detects whether the liquid is present on an object that is disposed lower than the final optical element of the projection optical system at a time when the image of the pattern is projected by the projection optical system onto the substrate, the object being at least one of the substrate stage, the substrate and a member that moves with the substrate stage." Mulkens et al. determines whether liquid is present before an image of a pattern is projected by a projection optical system onto the substrate. Based on the detection results made by Mulkens et al., an

appropriate lens is incorporated into the system (depending on whether or not liquid is detected), and subsequently the image of the pattern is projected by the projection optical system onto the substrate.

In rejecting claim 1, the Office Action asserted that the previously-recited "exposure light" corresponds to the "electromagnetic waves" referenced in paragraph [0105] of Mulkens et al., and that the Mulkens et al. electromagnetic waves are emitted onto the substrate which is "located by the projection optical system." The claims have been amended to clarify that the detection apparatus performs its detection of liquid "at a time when the image of the pattern is projected by the projection optical system onto the substrate" (emphasis added) and thus independent claim 1 now is even more clearly patentable over Mulkens et al.

Withdrawal of the rejection is requested.

Claims 1-15, 19, 22-30, 35-37, 41 and 48-50 stand rejected under 35 U.S.C. §102(e) over Iriguchi (US2004/0103950). The rejection is respectfully traversed.

Iriguchi does not disclose each and every feature recited in independent claims 1, 24 and 36. Regarding claims 1, 24 and 36, Iriguchi does not disclose an arrangement in which a liquid is provided in a space between the final optical element of a projection optical system (through which an image of a pattern is projected onto a substrate held by a substrate stage) and the substrate so as to contact the final optical element and the substrate. In Iriguchi, exposure light that does not convey an image of a pattern is emitted from light source 280 and passes through prism 202 and liquid 204 before reaching a hologram mask 200. An image of the pattern of the mask 200 then passes through a gas-filled space before being transferred onto a surface of a substrate 212. Thus, liquid is provided between prism 202 and mask 200, but is not present between, and does not contact, the final optical element of a projection optical system and a substrate held by a movable substrate stage. Furthermore, prism 202,

while projecting image-less light, is not "a projection optical system through which an image of a pattern is projected ..." (emphasis added).

Iriguchi also does not disclose additional features of independent claims 1, 24 and 36. Regarding claim 1, Iriguchi does not disclose the claimed "detection apparatus that detects whether the liquid is present on an object ..., the object being at least one of the substrate stage, the substrate and a member that moves with the substrate stage." As noted above, the detected liquid in Iriguchi is between prism 202 and mask 200. Regarding claim 24, Iriguchi does not disclose the claimed "liquid supply system ... which supplies the liquid ... such that the liquid forms an immersion area on a surface of the substrate or on a surface of the substrate stage adjacent to the substrate or on both the surface of the substrate and the surface of the substrate stage ..." and the claimed detection apparatus that "detects a position of an edge portion of the immersion area ...". In Iriguchi, there is no immersion area formed on a surface of a substrate and/or the substrate stage adjacent to the substrate. Regarding claim 36, Iriguchi does not disclose "a shape detection apparatus that obtains a shape of the liquid on an object ..., the object being at least one of the substrate stage, the substrate and a member that moves with the substrate stage." In Iriguchi, the liquid is formed on the mask, not the substrate stage or the substrate or a member that moves with the substrate stage.

Accordingly, independent claims 1, 24 and 36 along with their dependent claims are patentable over Iriguchi. Withdrawal of the rejection is requested.

Claims 18 and 34 stand rejected under 35 U.S.C. §103(a) over Iriguchi in view of Murakami (US2001/0055100). Claims 20, 21 and 31-33 stand rejected under 35 U.S.C. §103(a) over Iriguchi. Claims 38-40 stand rejected under 35 U.S.C. §103(a) over Iriguchi in view of Kroupenkine et al. (U.S. Patent No. 6,538,823). The rejections are respectfully traversed.

Neither Murakami nor Kroupenkine et al. overcomes the deficiencies in Iriguchi et al. noted above with respect to independent claims 1, 24 and 36. Accordingly, claims 18, 20, 21, 31-34 and 38-40 also are patentable. Withdrawal of the rejections is requested.

Claims 1, 2, 13, 15-17, 24 and 36 stand rejected under 35 U.S.C. §102(e) over Streefkerk et al. (US2006/0007419). The rejection is respectfully traversed.

The present application is a U.S. National Stage of International Application No. PCT/JP2005/001225 filed January 28, 2005. In addition, the present application claims priority from Japanese Application No. 2004-26864 filed February 3, 2004. Applicants submit a verified English translation of Applicants' Japanese priority application, which supports all pending claims of this application. Accordingly, Applicants are entitled to rely on the February 3, 2004 filing date of the Japanese application, which is prior to the July 4, 2004 U.S. filing date of Streefkerk et al. Thus, Streefkerk et al. does not qualify as a reference against Applicants' application. Withdrawal of the rejection is requested.

Claim 42 stands rejected under 35 U.S.C. §102(b) over Kroupenkine et al. The rejection is respectfully traversed.

Kroupenkine et al. does not disclose each and every feature of independent claim 42. In particular, Kroupenkine et al. does not disclose an exposure apparatus comprising "a substrate stage on which a substrate is held, the substrate stage being movable while holding the substrate," "a projection optical system through which an image of a pattern is projected onto the substrate held by the substrate stage when the substrate is disposed adjacent to a final optical element of the projection optical system, a liquid being provided in a space between the final optical element and the substrate so as to contact the final optical element and the substrate" and "a detection apparatus that detects a contact angle of the liquid, on an upper surface of the substrate stage that holds the substrate, with respect to the upper surface of the substrate stage." Kroupenkine et al. discloses a tunable liquid microlens that is formed by a

droplet of liquid provided on an insulating layer having electrodes therein in order to control the shape of the droplet. Withdrawal of the rejection is requested.

Claims 42-47 and 51 stand rejected under 35 U.S.C. §103(a) over Mulkens et al. in view of Kroupenkine et al. The rejection is respectfully traversed.

Applicants respectfully submit that there would have been no reason for one having ordinary skill in the art to modify the Mulkens et al. exposure apparatus in view of Kroupenkine et al. to result in the combination of features recited in independent claim 42. In particular, there would have been no reason to one having ordinary skill in the art to modify the Mulkens et al. exposure apparatus to include "a detection apparatus that detects a contact angle of the liquid, on an upper surface of the substrate stage that holds the substrate, with respect to the upper surface of the substrate stage." Mulkens et al. merely detects whether or not liquid is present and has no need to determine the contact angle of the liquid. Mulkens et al. does not suggest detecting the contact angle of the liquid and provides no reason to do so.

Kroupenkine et al. does not disclose an exposure apparatus of the type recited in Applicants' claim 42 or of the type disclosed by Mulkens et al. Kroupenkine et al. discloses a tunable liquid microlens in which electrodes in an insulative substrate are actuated to control the contact angle of the liquid droplet so as to change the characteristics of the droplet-formed microlens.

The Office Action asserts that "at the time the invention was made, it would have been obvious to one of ordinary skill in the art to determine the contact angle using the detector 22 of Mulkens et al., as taught by Kroupenkine et al., for the purpose of determining the attraction between the liquid and the object, in order to achieve optimal immersion exposure." The alleged motivation cited in the Office Action does not come from Mulkens et al. or Kroupenkine et al. Neither reference discloses or suggests determining the attraction between the liquid and the object. Applicants respectfully submit that the Office Action relies upon

impermissible hindsight in modifying Mulkens et al. in view of Kroupenkine et al.

Withdrawal of the rejection is requested.

III. Conclusion

In view of the foregoing, Applicants respectfully submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,



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MAC/lmf

Attachment:

Verified English Translation of Japanese Application No. 2004-26864

Date: December 22, 2009

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